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(10) Hypochlorite bleaching compositions

(11) Liquid aqueous bleaching compositions are disclosed which comprise hypochlorite and more than 0.1% by weight of periodate or mixtures thereof. The compositions have a pH as is of from 9 to 14, and may further comprise a precipitation/buffering system. A method of bleaching fabrics with said compositions is also disclosed.

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Technical field

The present invention relates to a liquid bleaching composition which is suitable for laundry applications including hand washing as well as washing with automatic washing machines.

Background of the invention

Liquid bleaching compositions are well-known in the art. Amongst the different bleaching compositions available, those relying on bleaching by hypochlorite are often preferred, mainly for performance reasons. Representative of the art is, for example, WO-88-05461 which discloses an aqueous composition comprising hypochlorite, sodium carbonate and sodium hydroxide and the use of said composition for removing stains from the fabrics.

However, the drawbacks associated with the use of chlorine-based compositions are that said compositions both damage and yellow the fabrics.

It is therefore an object of the present invention to provide a hypochlorite-containing composition, suitable for use in laundry, whereby fabric safety is improved.

It is a further object of the present invention to provide a hypochlorite-containing composition, suitable for use in laundry, whereby the fabric whiteness is improved.

It has now been found that the previous objects can be met by formulating hypochlorite bleach compositions comprising a periodate, or mixtures thereof. The compositions of the present invention provide outstanding fabric safety as well as fabric whiteness on the fabrics treated therewith. Indeed, it has been found that for any given composition comprising an alkali metal hypochlorite, adding periodate will improve both the fabric safety and the fabric whiteness on the fabrics treated therewith. In a preferred embodiment of the present invention, the hypochlorite bleach compositions herein further comprise a buffering/precipitation system, e.g. carbonate salts and/or silicate salts.

A further advantage of the compositions of the present invention is that on top of their fabric safety properties and whitening action said compositions allow also good stain removal.

US 4 065 545 relates to the stabilization of aqueous hypochlorite solutions. This patent discloses solutions of hypochlorite comprising up to 0.1% by weight of periodate ions. Optionally said solutions may also contain silicate ions and/or caustic soda and/or sodium carbonate.

EP-A- 478066 discloses microemulsion detergent compositions comprising hypochlorite and having a pH of at least 12. Said compositions further comprise amongst other components, sodium carbonate, alkali metal hydroxide and from 0.01% to 0.3% by weight of an alkali metal periodate, such as potassium periodate or sodium periodate. Periodate is included in the microemulsion compositions for its stabilizing effect on hypochlorite. This patent application further discloses that the compositions therein are all-purpose cleaning compositions particularly adapted to the cleaning of hard-surfaces. Laundry application is also mentioned.

Actually, the benefits derivable from the use of a periodate in an aqueous bleaching composition comprising hypochlorite for bleaching fabrics, i.e. improved fabric safety and/or fabric whiteness on the fabrics treated therewith, have not been acknowledged in the prior art.

Summary of the invention

The present invention encompasses an aqueous liquid bleaching composition comprising an alkali metal hypochlorite and more than 0.1% by weight of the total composition of a periodate, said compositions not being in the form of a microemulsion.

In a preferred embodiment, the compositions according to the present invention further comprise a buffering/precipitation system, preferably carbonate salts and/or silicate salts.

The present invention further encompasses a method of bleaching and/or washing fabrics to improve fabric safety and/or fabric whiteness which comprises the step of contacting said fabrics with an aqueous liquid hypochlorite bleach composition having a pH as is of from 9 to 14 and comprising a periodate. In a preferred embodiment, the compositions used in said method further comprise a buffering/precipitation system, preferably carbonate salts and/or silicate salts.

Detailed Description of the invention

As a first essential ingredient, the compositions of the present invention comprise hypochlorite. Various forms of alkali metal hypochlorite are commercially available and, although this is not critical for the present

invention, it is preferred herein to use sodium hypochlorite. Compositions according to the present invention comprise a bleaching amount of alkali metal hypochlorite, which typically represents from 2% to 10% by weight of the total composition, based on active chlorine, of alkali metal hypochlorite. Preferred compositions herein comprise from 3% to 6%, based on active chlorine, of alkali metal hypochlorite.

As a second essential ingredient, the compositions according to the present invention comprise a periodate, or mixtures thereof. The periodates may be added as such or may be made in situ by any suitable reactions of appropriate iodine compounds. Accordingly suitable periodates for use in the present compositions include alkali metal periodates such as sodium and potassium periodates. Preferred herein is to use sodium periodate. The compositions of the present invention comprise more than 0.1% by weight of the total composition of said periodate, or mixtures thereof, preferably of from 0.11% to 2% and more preferably of from 0.11% to 1.5%.

We speculate that the periodate ions coming from the dissociation of periodates have an action which allows to improve the fabric safety and the fabric whiteness of fabrics contacted with an aqueous liquid hypochlorite-containing composition comprising said periodates. Indeed, said periodate ions allow to reduce or even eliminate the metal impurities both in said compositions as is and especially in the washing environment. Said metal impurities include heavy metal ions such as Cu, Fe, Ni, Co and the like, and have been found to adversely affect both fabric safety and fabric whiteness. The above mentioned action of periodate ions is sustained by the presence of a buffering/precipitation system as herein after defined. Indeed, said buffering/precipitation system allows to remove from the washing solution magnesium and calcium which would otherwise bind to periodate ions, and thus partially inactivate them. Additionally, said buffering/precipitation system prevents the pH drop in the washing solution to values at which periodate ions become no longer stable and decompose.

Indeed, we believe that in the washing environment said metal ions catalyze the attack of hypochlorous acid on fabrics with the generation of yellow oxidized species. We further believe that said metal ions are adsorbed per se on oxidized fabrics as colored species and catalyze the degradation of the brighteners adsorbed on fabrics. Also said metal ions stabilize colored pigments or enzymatic stains such as blood and grass. And finally said metal ions catalyze the depolymerisation of cotton fibers which leads to reduced tensile strength of the fabrics, thereby reducing fabrics resistance.

It is in the alkaline range that the optimum stability and performance of the hypochlorite are obtained. Thus, the compositions according to the present invention have a pH as is of from 9 to 14, preferably of from 9.5 to 13 and more preferably of from 9.5 to 12. Suitable means to achieve such pH value include strong sources of alkalinity. Accordingly, the compositions herein comprise less than 2% by weight of the total composition of a strong source of alkalinity, or mixtures thereof, preferably of from 0.04% to 1.5% and more preferably of from 0.5% to 0.9%. Examples of strong sources of alkalinity are alkali metal hydroxides, such as potassium and/or sodium hydroxide, or alkali metal oxides such as sodium and/or potassium oxide, or mixtures thereof.

In a preferred embodiment, the compositions of the present invention may further comprise a buffering/precipitation system. Particularly suitable to be used herein are silicate or carbonate salts, or mixtures thereof. Preferred alkali metal salts of silicate and carbonate are sodium silicate and sodium carbonate, both of which are commercially available, or mixtures thereof. Other precipitation/buffering systems could be conveniently used herein such as sodium borate and sodium sesquicarbonate. Actually any buffering/precipitation system having the property of keeping the pH above the value 8 when following a dilution of 0.3 to 1.7 % is suitable to be used in the present invention.

In the preferred embodiment, the compositions herein comprise up to 5% by weight of the total composition of a carbonate salt, or mixtures thereof, preferably from 0.1% to 4% and more preferably from 0.1% to 3% and up to 5% by weight of the total composition of a silicate salt, or mixtures thereof, preferably from 0.1% to 4% and more preferably from 0.2% to 3%.

Indeed, said buffering/precipitation system allows buffering of the pH of the present compositions. Indeed, due to such a buffering/precipitation system as defined herein before, the pH of a composition according to the present invention remains constant throughout use, i.e. the pH of a diluted composition is buffered from the moment the dilution is completed and until said hypochlorite bleaching composition is started to be rinsed away from the fabrics to which it has previously been contacted. Also, we speculate that the improvement in fabric safety is optimized by the presence of said buffering/precipitation system, which by its buffering action, reduces the conversion of hypochlorite into hypochlorous acid, a species which we have found to be responsible for the fabric damage. It is also suspected that the buffering of the hypochlorite compositions of the present invention reduces harshness to hands. Also said buffering/precipitation system removes from the wash solution calcium and magnesium.

The compositions of the present invention are aqueous liquid bleaching compositions. Accordingly, the compositions of the present invention comprise from 70% to 97% by weight of the total composition of water, preferably from 75% to 96% and more preferably from 78% to 94%.

The compositions according to the present invention may further comprise optional ingredients such as bleach-stable surfactants, organic or inorganic alkalis, pigments, dyes, optical brighteners, solvents, chelating agents, radical scavengers, perfumes, bleach-stable perfume stabilizers and the like.

The compositions of the present invention provide improved fabric safety as well as improved fabric whiteness. By "improved fabric safety" it is meant herein that the damage caused on fabric by using the hypochlorite compositions of the present invention is reduced compared to the damage caused by using the same hypochlorite compositions but without any periodate. By "improved fabric whiteness" it is meant herein that the whiteness on fabric achieved by using the hypochlorite compositions of the present invention is improved compared to the whiteness obtained by using the same hypochlorite compositions but without any periodate.

The compositions according to the present invention are used in diluted form in laundry application. The expression "use in diluted form" herein includes dilution by the user, which occurs for instance in hand laundry applications, as well as dilution by other means, such as in a washing machine. Typical dilution levels are of from 0.4% to 20% for hand laundry application and 0.1% to 10% in a washing machine.

The present invention further encompasses a method of bleaching fabrics which comprises the step of contacting said fabrics with an aqueous bleaching composition having a pH as is of from 9 to 14 which comprises an alkali metal hypochlorite, or mixtures thereof and a periodate, or mixtures thereof. In a preferred embodiment, the compositions used in said method of bleaching fabrics may further comprise a buffering/precipitation system, preferably carbonate salts and/or silicate salts. Said method according to the present invention improves the fabric safety and/or fabric whiteness.

More specifically, the method of bleaching fabrics according to the present invention comprises the steps of first contacting said fabrics with an aqueous bleaching composition having a pH as is of from 9 to 14 which comprises an alkali metal hypochlorite, or mixtures thereof and a periodate, or mixtures thereof, then allowing said fabrics to remain in contact with said bleaching composition, for a period of time sufficient to bleach said fabrics, typically 3 to 60 minutes, preferably 5 to 30 minutes, then rinsing said fabrics in water to remove said bleaching composition. If said fabrics are to be washed, i.e. with a conventional composition comprising at least one surface active agent, it is preferred to perform the method herein before said fabrics are washed. Indeed, it has been observed that bleaching said fabrics with the bleaching compositions according to the present invention prior to washing them with a detergent composition provides superior whiteness and stain removal with less energy and detergent than if said fabrics are washed first, then bleached. Accordingly, said method according to the present invention further comprises a subsequent step where said fabrics are washed with a detergent composition comprising at least one surface active agent.

The present invention will be further illustrated by the following examples.

#### Experimental data

The following compositions are made by mixing the listed ingredients in the listed proportions:

Compositions (weight %)	1	2
Sodium hypochlorite	5.0	5.0
Sodium hydroxide	0.7	0.7
Sodium carbonate	1.0	1.0
Sodium periodate	—	0.5
Water	100%	
pH	13	13

Composition 1 is a hypochlorite-containing composition taken as a reference and commercially available. Composition 2 is representative of the present invention, i.e. composition 2 comprises sodium hypochlorite, a buffering/precipitation system (sodium carbonate) and sodium periodate.

A multicycle test has been carried out. A washing was performed in a glass beaker at 70°C for 45 minutes with a washing solution comprising 12.5 g/l of a composition herein before mentioned. Then the ribbons were added into the washing solution. At the end of each washing cycle the ribbons were rinsed.

After 3 washing cycles the damage on the fabrics was evaluated by pulling said ribbons until they broke. The force necessary to break the ribbons was measured with an Instron tensiometer. The lower the force needed to break said ribbons, the more serious is the damage caused on the fabrics.

The results obtained were the following:

- 65 Kg of tensile strength for a ribbon taken as a reference, i.e. a ribbon which has not been washed.
- 20 Kg of tensile strength loss for a ribbon after 3 washing cycles when using composition 1, as compared to the ribbon taken as a reference.
- 16 Kg of tensile strength loss for a ribbon after 3 washing cycles when using composition 2, as compared to the ribbon taken as a reference.

Comments:

- The data clearly shows the unexpected safety improvement delivered by the aqueous compositions of the present invention comprising sodium hypochlorite, sodium carbonate and sodium periodate, as compared to a composition of the prior art (composition 1). Indeed, it has been surprisingly observed that after only 3 wash cycles a reduced fabric damage is achieved with the composition of the present invention (composition 2) as compared to the composition of the prior art (composition 1).

#### Example

The following example will further illustrate the present invention. The following composition is made by mixing the listed ingredients in the listed proportions:

Composition (weight %)	1
Sodium hypochlorite	5.0
Sodium hydroxide	0.7
Sodium carbonate	1.0
Sodium silicate	1.0
Sodium periodate	0.3
Water up to	100%
pH	13

- Composition 1 allows to obtain outstanding fabric safety as well as outstanding fabric whiteness, when used to bleach fabrics. This composition is suitable to be used in hand washing applications as well as in washing with automatic washing machines.

#### Claims

1. An aqueous liquid bleaching composition comprising an alkali metal hypochlorite and more than 0.1% by weight of the total composition of a periodate, said composition not being in the form of a microemulsion.
2. A method of bleaching fabrics to improve fabric safety and/or fabric whiteness which comprises the step of contacting said fabric with an aqueous liquid bleaching composition having a pH as is of from 9 to 14, comprising an alkali metal hypochlorite and a periodate, said bleaching composition being in its diluted form.
3. A method of bleaching fabrics according to claim 2 which, after the step of contacting said fabrics with said bleaching composition, further comprises the steps of:
  - allowing said fabrics to remain in contact with said bleaching composition for a period of time sufficient to bleach said fabrics,
  - then rinsing said fabrics in water to remove said bleaching composition.
4. A method according to claim 3 which further comprises a subsequent step where said fabrics are washed with a detergent composition comprising at least one surface active agent.

5. A method or composition according to any of the preceding claims wherein said composition comprises from 2% to 10% by weight of the total composition, based on active chlorine, of hypochlorite, preferably of from 3% to 6%.
- 5 6. A method or composition according to any of the preceding claims wherein in said composition said periodate is an alkali metal periodate, preferably sodium periodate.
7. A method or composition according to any of the preceding claims wherein said composition comprises from 0.11% to 2% by weight of the total composition of said periodate or mixtures thereof, preferably  
10 from 0.11% to 1.5%.
8. A composition or method according to any of the preceding claims wherein said composition further comprises a buffering/precipitation system.
- 15 9. A composition or method according to claim 8 wherein said buffering/precipitation system comprises carbonate salts, silicate salts or mixtures thereof.
10. A composition or method according to claim 9 wherein said composition comprises up to 5% by weight of the total composition of sodium carbonate, preferably from 0.1% to 4%, more preferably from 0.1%  
20 to 3%, and wherein said carbonate salt is preferably sodium carbonate, and up to 5% by weight of the total composition of a silicate salt, preferably from 0.1% to 4%, more preferably from 0.2% to 3% and wherein said silicate salt is preferably sodium silicate.
11. A method or composition according to any of the preceding claims wherein said composition has a pH  
25 as is of from 9 to 14, preferably of from 9.5 to 13 and more preferably of from 9.5 to 12.



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# EUROPEAN SEARCH REPORT

Application Number  
EP 94 87 0104

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claims	CLASSIFICATION OF THE APPLICATION (INCL. 4)
X	EP-A-0 079 102 (UNILEVER) * page 4, line 11 - line 36; claims 1,6,7; example 1 *	1,5-9	C1103/395
O,A	WO-A-88 05461 (MOLONY) * claims 1-4,8,11,14,18 *	1-5,8-10	
O,A	US-A-4 065 545 (GAMLEN) * column 2, line 1 - line 42; claims *	1,5,6,8,9	
O,A	EP-A-0 478 086 (COLGATE - PALMOLIVE CO.) * claims 1-7 *	1,5-7,11	
A	EP-A-0 565 788 (COLGATE - PALMOLIVE CO.) * claims 1-4,8-12 *	1,5,8,9	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Incl. C.4)
			C110
Place of search		Date of completion of the search	Examiner
THE HAGUE		28 November 1994	Serbetsoglou, A
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosures P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application S : document cited for other reasons B : member of the same patent family, corresponding document	

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